

## **West of River Stress Scenario for CTPG**

RETI Stakeholder Steering Committee

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### **Background**

RETI has been asked by the California Transmission Planning Group (CTPG) to assist in the preparation of a renewable energy generation scenario which includes import of substantial amounts of renewable energy into Southern California across transmission lines known collectively as the West of River Path (Path 46). CTPG plans to examine the implications of this scenario for California transmission planning in Phase 4 of its 2010 work. RETI and CTPG continue to collect data on renewable generation and transmission planning from utilities and sub-regional planning groups throughout WECC. The structure of the proposed scenario was discussed by RETI's Regional Transmission Working Group (RTWG) for several weeks. At its meeting 7 October, the RETI Stakeholder Steering Committee (SSC) modified the RTWG proposal, as described below.

The changes made by the SSC to the RTWG proposal can be summarized as follows:

- Renaming the scenario to "West of River Stress Scenario", reflecting the fact that certain import portals have been excluded (item #2 below);
- Use of the latest "discounted core" project list instead of the list used in an earlier RETI scenario (item #3 below);
- Moving the wind energy assumed for the North Gila portal to Palo Verde (item #4 below).

### **Purpose of the Scenario**

The purpose of the scenario is to examine the adequacy of California's West of River transmission path to handle substantial amounts of renewable energy imported into Southern California. Adequacy of transmission outside California to deliver this energy to the California system will not be considered by CTPG in its Phase 4 study of this scenario.

### **Basic Considerations for the Scenario**

In order to specify the scenario sufficiently, several considerations must be addressed.

1. The amount of energy to be imported. CTPG assumes that the total amount of new renewable energy requiring transmission access and needed to meet a 33% renewable portfolio standard (RPS) equals the amount estimated earlier by RETI, known as the renewable 'net short', 52,764 GWh/year. This value has also been used in previous CTPG studies. The RTWG has discussed the amount of energy to be imported in this scenario as a percentage of the net short.
2. Locations or 'portals' at which the imported energy will be assumed to be injected into the California transmission system and the amounts of energy imported at each location. The choice of these portals and import levels helps determine power flows in California and throughout the WECC.
3. Resources providing the remainder of the net short.
4. Out-of-state renewable energy resources which will provide the imported energy and the characteristics of these resources.

The RTWG and the SSC considered all of these issues, as discussed below. This paper describes the scenario accepted by SSC on which the group reached near consensus. Some

SSC members who did not participate in the working group discussion have requested additional time to consider the scenario and have requested that RETI withhold its approval pending further review.

## Import Energy Recommendation

The majority of RTWG participants agree that a scenario in which approximately **40% of the net short** is imported into Southern California on the West of River Path represents a reasonable level for purposes identified by CTPG. The SSC did not modify the RTWG recommendation.

This 40% level is comparable to imports in the heavy Northwest scenario previously studied by CTPG.<sup>1</sup> It is believed to be large enough to significantly stress important elements of the California system and allow the studies to provide useful information without being so large as to be extremely unlikely ever to occur. As discussed below, resources comprising the remaining 60% of the net short may include additional out-of-state resources.<sup>2</sup>

Some RTWG participants argued for a larger amount, concerned that existing available transmission capacity and fossil energy ‘redispatch’<sup>3</sup> could result in flows which do not sufficiently stress the system and therefore do not provide useful information. In addition, there is a large amount of new transmission capacity in various stages of planning to deliver renewable energy to California far in excess of the 40% level.

The current value of the RETI net short is **52,764 GWh/year**. 40% of this amount is **21,106 GWh/year**. If the renewable resources providing this energy have an annual average capacity factor of 35%, for example, the nameplate capacity required would be **6884 MW**. The capacity factors and other characteristics of resources proposed to be used in the scenario are discussed below.

## Scenario Import ‘Portals’

After considerable discussion, there is apparent consensus from RTWG and SSC participants that, for purposes of this scenario, the following locations (substations) should be used as the portals at which the imported energy connects to the California system. In addition, there is near consensus on the amounts of renewable energy imported through each portal, shown as a fraction of the scenario import total. The SSC did not change the portals identified by the RTWG. It noted, however, that limiting imports to these portals and excluding others is tantamount to focusing transmission issues on the West of River Path (Path 46) and therefore changed the name of the scenario to “West of River Stress Scenario”. As described below, the SSC also moved wind energy assumed for the North Gila portal to Palo Verde, thereby changing the energy totals for those two portals.

- Eldorado<sup>4</sup>, NV (50%)
- Palo Verde, AZ (37.5%)
- North Gila, AZ (12.5%)

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<sup>1</sup> See CTPG Phase 3 Report.

<sup>2</sup> The so-called ‘discounted core’ projects included in the first scenario given to CTPG by RETI included some out-of-state projects.

<sup>3</sup> Under current demand forecasts, attaining the 33% RPS goal would require a decrease in conventional generation. CTPG accordingly decreases or ‘redispatches’ fossil energy resources in its power flow model studies. A decrease in the amount of fossil energy imported is expected to increase available transmission capacity on lines carrying imported renewable energy in this scenario.

<sup>4</sup> Eldorado serves as a proxy for the substations in Southern Nevada serving California.

Limiting the imports to the three portals focuses CTPG's study on the West of River Path (Path 46.) These are not the only substations through which power flows into Southern California. Some participants suggested that the Intermountain Power Plant (IPP) in Utah, the Control substation feeding the Owens Valley line, and Imperial Valley's receipt of proposed energy from Baja California also be included.

### **Additional Resources**

There appears to be consensus among SSC participants that the remaining 60% of the required renewable energy resources should be chosen in a manner similar to that used in the first scenario given by RETI to CTPG earlier this year. In that scenario, the so-called 'heavy in-state scenario', 70% of the net short came from California resources and 30% came from out-of-state (OOS) resources. Those resources were chosen to include a 'discounted core' of projects having power purchase contracts (PPAs) with investor-owned utilities and advanced permitting status. In addition to the discounted core, additional energy from California and OOS resources having lowest cost and least environmental concerns as identified by RETI's ranking methodology were included in the heavy in-state scenario. The SSC determined that the most recent list of projects qualifying for discounted core status be used in the scenario, instead of the list used for the heavy in-state scenario.

### ***Discounted Core Projects***

The proposed scenario includes a discounted core of renewable projects similar to that used in the earlier heavy in-state scenario. These projects have approved PPAs and permit applications which have been approved or at least filed. The most recent list of projects available contribute energy to CREZ as shown in the table below:

**Table 1 – Discounted Core**

	Biogas/Biomass		Geothermal		Solar PV		Solar Thermal		Wind		TOTAL	
	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh
Alberta		-		-		-		-	516	1,356	516	1,356
Arizona		-		-	290	635		-		-	290	635
Carrizo N/S		-		-	849	1,859		-		-	849	1,859
Fairmont		-		-	230	504		-		-	230	504
Imperial South		-	40	298	49	108	300	657		-	389	1,063
Kramer		-		-		-	250	548		-	250	548
Montana		-		-		-		-	300	788	300	788
Mountain Pass		-		-		-	410	898		-	410	898
Nevada C		-		-	50	110	400	876		-	450	986
New Mexico	32	140		-		-		-		-	32	140
NonCREZ	117	512		-	50	110	150	329		-	317	950
Northwest (OR, WA)		-		-		-		-	614	1,614	614	1,614
Palm Springs		-		-		-		-	77	202	77	202
Pisgah		-		-		-	500	1,095		-	500	1,095
Riverside East		-		-	550	1,205	492	1,077		-	1,042	2,282
Round Mountain		-		-		-		-	78	206	78	206
San Bernardino - Lucerne		-		-		-		-	42	110	42	110
San Diego South	21	92		-		-		-		-	21	92
Santa Barbara		-		-		-		-	83	217	83	217
Solano		-		-		-		-	38	100	38	100
Tehachapi		-		-		-		-	1,912	5,024	1,912	5,024
Utah-Southern Idaho		-		-		-		-	90	237	90	237
<b>TOTALS</b>	170	745	40	298	2,068	4,530	2,502	5,479	3,750	9,854	8,530	20,905
											OOS	5,755

As shown in Table 1, the discounted core includes 5,755 GWh/yr of energy from OOS resources located in the areas shown in Table 2:

**Table 2 – OOS Resources in Discounted Core**

	Biogas/Biomass		Geothermal		Solar PV		Solar Thermal		Wind		TOTAL	
	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh	MW	Est. GWh
Alberta		-		-		-		-	516	1,356	516	1,356
Arizona		-		-	290	635		-		-	290	635
Montana		-		-		-		-	300	788	300	788
Nevada C		-		-	50	110	400	876		-	450	986
New Mexico	32	140		-		-		-		-	32	140
Northwest (OR, WA)		-		-		-		-	614	1,614	614	1,614
Utah-Southern Idaho		-		-		-		-	90	237	90	237
<b>TOTALS</b>	32	140	-	-	340	745	400	876	1,520	3,995	2,292	5,755

### ***Additional California Resources***

In the scenario described here, it is suggested that the entire discounted core (including OOS resources) be included in the 60% of 'additional resources'. I.e. none of the OOS resources in the discounted core are counted toward the 40% imported through the Southwest. The proposed breakdown of resources in the scenario, by area and annual energy, is shown in Table 3:

<b>Table 3 – Proposed Resources Scenario</b>		
<b>Resource</b>	<b>GWh/year</b>	<b>% Total</b>
SW Imports	21,106	40%
Discounted Core	20,905	40%
Other California	10,753	20%
<b>Totals</b>	<b>52,764</b>	<b>100.0%</b>

In the heavy in-state scenario, 'Other California' resources were chosen from CREZ in the lower left-hand quadrant of the RETI bubble chart, pro rated to provide a total of 70% from California resources. In the scenario considered here, it is suggested that these same CREZ be pro rated to provide the 10,753 GWh/yr shown in Table 3.

### **Characterization of SW Import Resources**

In addition to annual energy provided by renewable energy resources, transmission modeling requires knowledge of power flows from these resources which depend on generation technology, nameplate capacity, and time-of-day (TOD) profiles. In the heavy in-state scenario, Black & Veatch provided this information for the discounted core projects and for California CREZ. This information is also available for the Western renewable energy zones (WREZ) which provide energy for the SW imports, once these WREZ are assumed to be known.

For purposes of the scenario, the SSC chose the breakdown of import resources shown below, by portal:

<b>Table 4 – SW Imports by Portal</b>		
<b>Portal</b>	<b>GWh/yr</b>	<b>% Total</b>
Eldorado	10,553	50%
Palo Verde	7,915	37.5%
North Gila	2,638	12.5%
<b>Totals</b>	<b>21,106</b>	<b>100%</b>

Half of the total SW import energy is assumed to be from wind and half from solar resources. However, the WREZ feeding each portal are proposed to be different for Nevada and Arizona portals, as shown in table below:

<b>Table 5 – SW Imports by Portal and Resource WREZ</b>	
<b>Portal</b>	<b>GWh/yr</b>
Eldorado	10,553
Solar, S_NV	5,277
Wind, S_NV & NW_AZ	2,639
Wind, Wyoming	2,638
Palo Verde	7,915
Solar, NW_AZ & SW_AZ	2,638
Wind, NE_AZ & NM	5,277
North Gila	2,638
Solar, SW_AZ	2,638
Wind	0
<b>Total</b>	<b>21,106</b>

Black & Veatch has agreed to provide average capacity values and time of day profiles for whatever combination of resources and WREZ is chosen to supply energy to the portals. Maps of renewable energy projects having positions in interconnection queues in neighboring states are included in attachments to this document and are available on the RETI web site.

### **Conclusion and Next Steps**

The discussion above represents the RETI coordinators' best effort to describe the results of the scenario deliberations by the SSC, pending further review by SSC members.

CTPG's deadline requires them to proceed, using the SSC discussion as the basis for their scenario decisions. The second draft of the CTPG Phase 4 study plan is scheduled to be posted 14 October and the draft Phase 4 study report posted 22 November. A CTPG stakeholder meeting to discuss the results is scheduled for 1 December.